FALSEWORK TOWER STABILITY

Falsework towers with discontinuous legs require additional analysis to ensure stability (see Chapter 5) in the various stages of loading. The stages of loading are when the tower is unloaded, when loaded with falsework stringers, and during various loaded conditions involving concrete placement.

In addition to resisting collapse, the tower must be able to resist overturning and sliding at each plane that the tower is discontinuous.

It is essential to remember that loaded towers generally will be more than adequately capable of resisting overturning moments. However, unloaded towers, both during erection and during removal sequences are the most vulnerable to overturning. Removal of portions of tower units while other portions are still loaded can lead to very unstable conditions.

The best way to illustrate proper methodology is with an example problem. In the following example assume that the bracing and other falsework features are adequate. It is important to consider the effects of concrete pour sequences, that is, what will happen with concrete weight in one long span but not in the other long span. The purpose of the example problem is solely to demonstrate stability analysis. Refer to Figure on Sheet C-12-2.

EXAMPLE PROBLEM

P_1 = 6,700 Lbs
P_2 = 7,000 Lbs
γ_w = weight of wood = 35 Lb/CF
H = 1,050 Lbs acting on one-half of a tower unit.

<u>Shear Resistance</u>

The shear at the elevation of the plane B discontinuity will govern since frictional resistance increases with the weight of additional material below that elevation.

Check shear resistance at plane B. The active horizontal load of 1,050 pounds will be resisted by the frictional capacity of 2 tower legs.

Single post weight= 40(35) = 1,400 Lb
Single cap weight = 10(35) = 350 Lb

Resistance = 0.3[6,700 + 7,000 + 2(1,400) + 2(1/2) (350)]
= 5,055 > 1,050 Lb

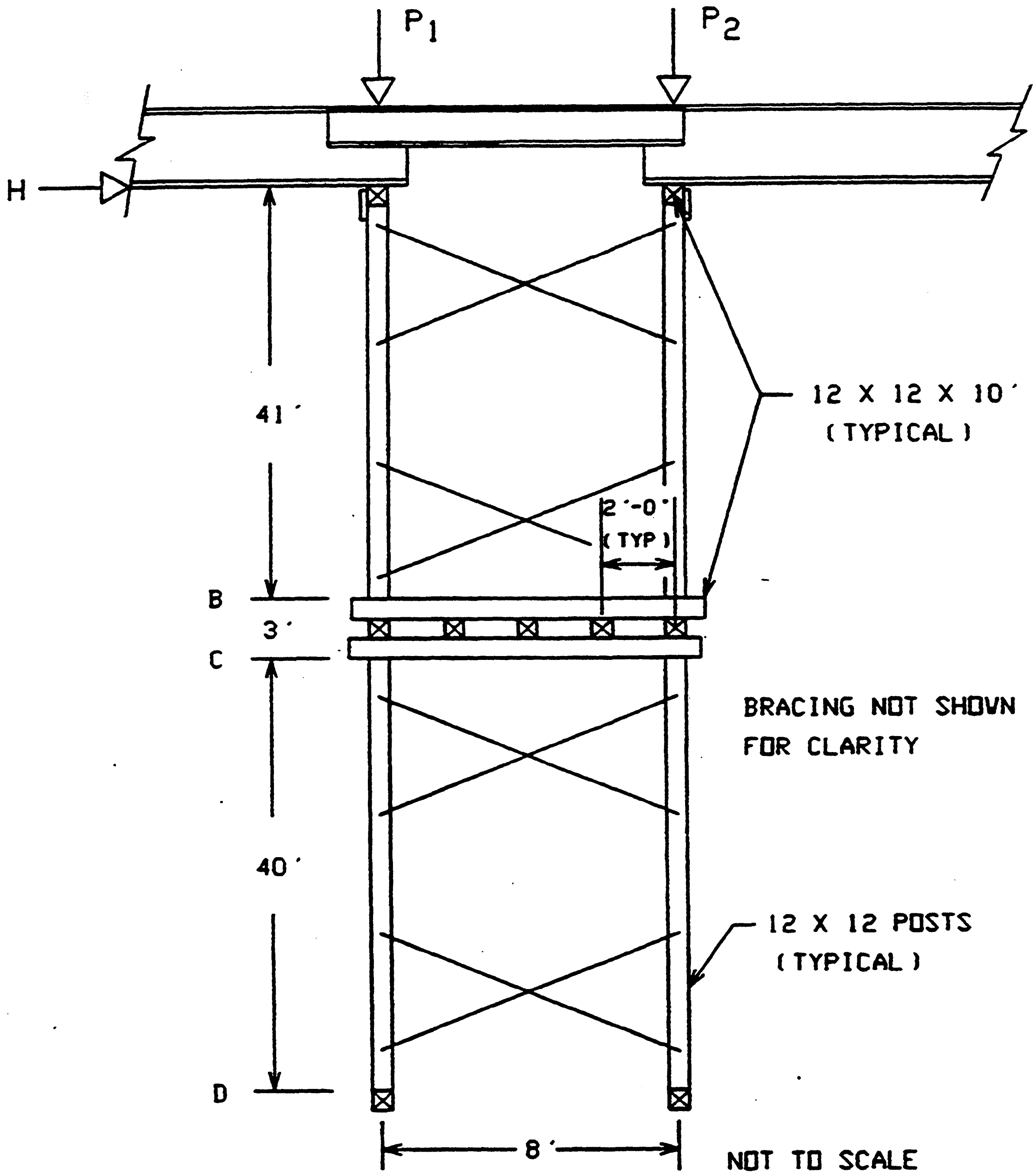
P1
P2
H
41'
12 X 12 X 10'
(TYPICAL)
2'-0"
(TYP)
B
3'
C
BRACING NOT SHOWN
FOR CLARITY
40'
12 X 12 POSTS
(TYPICAL)
D
8'
NOT TO SCALE

FIGURE 1

Overturning Resistance

Check overturning resistance at plane B, C, and D by taking moments about the heavier loaded post.

At Plane B:

M_{OT} = 41(H) = 41(1,050) = 43,050 Ft-Lbs.

M_R = 8(6,700) = 53,600
8(1,400) = 11,200
8(350/2) = 1,400
66,200 Ft-Lbs.

Safety Factor = 66,200/43,050 = 1.54

At Plane C:

M_{OT} = 44(1,050) = 46,200 Ft-Lbs.

M_R = Previous = 66,200 Ft-Lbs.
2 (350) (4) = 2,800
(l/2)(350)(8) = 1,400
(l/2)(350)(6) = 1,050
(1/2)(350)(4) = 700
(1/2) (350) (2) = 350
72,500 Ft-Lbs.

Safety Factor = 72,500/46,200 = 1.57

At Plane D:

M_{OT} = 84(1,050) = 88,200 Ft-Lbs.

M_R = Previous = 72,500 Ft-Lbs.
8(1,400) = 11,200
83,700 Ft-Lbs.

Safety Factor = 83,700/88,200 = 0.95 < 1.00
External bracing will be required to prevent overturning!